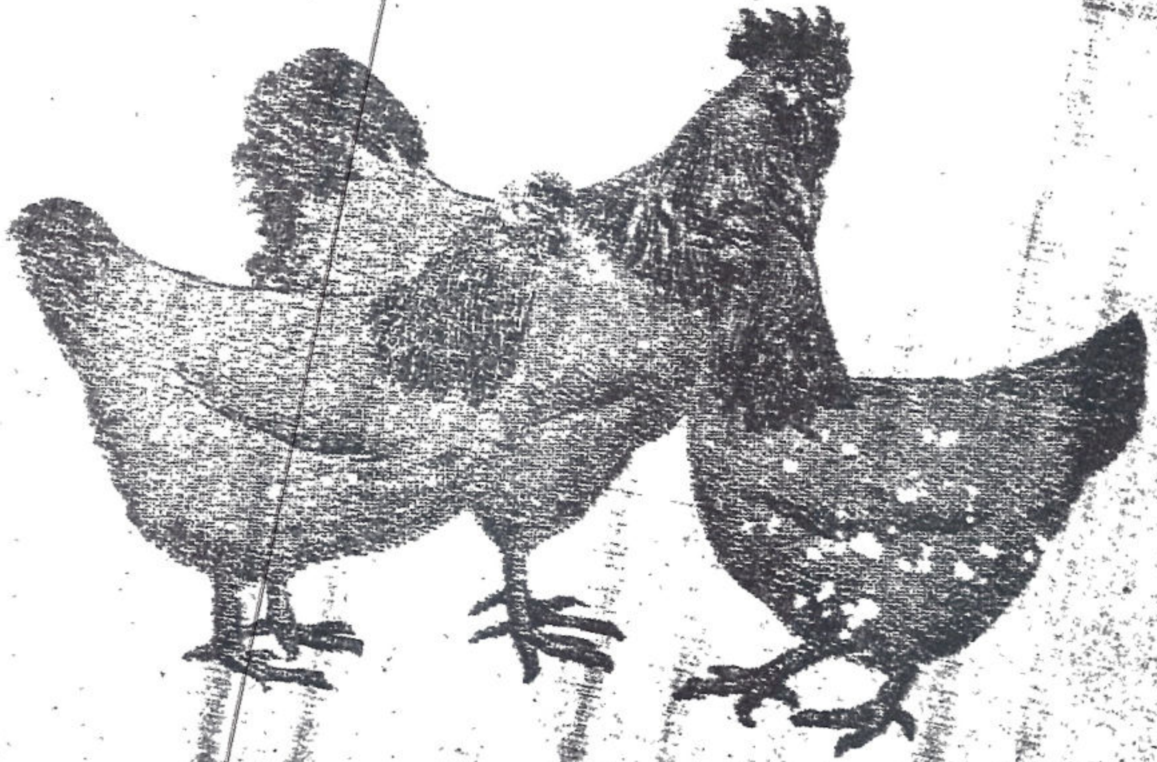


POULTRY KEEPING
AND DISEASE PREVENTION
IN
MALAYA

Ministry of Agriculture Publication.
Federation of Malaya

Price 50 cts.

MINISTRY OF AGRICULTURE
FEDERATION OF MALAYA

NOTES ON
POULTRY KEEPING
AND
DISEASE PREVENTION
IN MALAYA.

1957

CONTENTS

		PAGE
	Foreword	3
1.	Introduction	7
2.	Systems of Poultry Keeping	8
	Free Range	8
	Folding	9
	Semi-intensive	9
	Intensive	10
	Deep Litter	10
	Battery	11
3.	Selection of Birds	11
	Age of Selection	12
	Type of Bird	12
	Breeds Available	13
4.	Hatching of Eggs	14
5.	Rearing of Chickens	15
	Essential Points on Selection and Management	15
	Artificial Brooders	17
6.	Housing	19
	Range Shelter	19
	Night Ark	24
	"Packing Case" House	24
7.	Feeding	25
	"Balanced" Feeding	25
	Food Stuffs	27
	Feed Supplements	27
	Chickens and Growers	28
	Layers	30
	Green Vegetables, Lime and Vitamins	30
	The Mash	31
	Household Scraps	32
8.	Management	33
	Inspection	33
	Feeding	33

PAGE

Drinking Water 34
Laying Boxes 35
Sand Bath 35
Broody Hens 36
Site 36

9. Improvement of Stock 36
How to Cull 36

10. Economy 39
Sale of Produce 39

11. Marketing 39
Caponisation 39

12. Diseases 40
Introduction 40
Sulpha Drugs 42
Infectious Diseases 42
(Ranikhet, Fowl Pox, Infectious Coryza, Fowl Cholera, Coccidiosis, Infectious Laryngo-tracheitis, B.W.D.)

Worms 49
Lice, Ticks and Fleas 51
Scaly Leg 51
Favus 52
Bumble Foot 53
Emphysema 53
Vitamin Deficiency 53

13. Losses Due to Poison 54

14. Vices 54
Feather-picking and Cannibalism 54
Egg Eating 55

15. Conclusion 55

16. Books for Reference 55

APPENDICES

1. Deep Litter 65

2. Alternative Rations 65

FOREWORD

There is an urgent need for more poultry rearing in the Federation. How great is this need will be understood when it is realised that in 1955 nearly TWO MILLION head of live poultry, 60 TONS of dead poultry and 100 MILLION eggs were imported for consumption in the Federation. In other words over fourteen million dollars were paid to other territories for these articles of food some of which should — and could — be produced in the Federation itself.

The object of this booklet is to show how YOU can rear poultry successfully and with profit to yourself.

There are many ways of rearing, housing and feeding poultry, and each system of management has its own advocates. This booklet does not attempt to favour one system over another. There are, however, certain principles which apply to them all and it is with the object of presenting these principles in a simple form that this booklet has been prepared. Excessive detail on any single point has been avoided; the object is to acquaint the reader with sound commonsense methods of poultry rearing which can be applied in Malaya. As his interest and experience grow he will be in a position to modify his system according to the opportunities open to him.

The poultry keeper will be well advised to seek the advice of the nearest Veterinary or Agricultural Officer whenever in doubt about the welfare of his flock.

(Abdul Aziz bin Ishak)
Minister for Agriculture,
Federation of Malaya.

Kuala Lumpur,
November, 1956.

THE HEN

Alas! my child, where is the Pen
That can do justice to the Hen?
Like Royalty she goes her way,
Laying Foundations every day,
Though not for Public Buildings, yet
For Custard, Cake and Omelette.
Or if too old for such a use
They have their fling at some abuse . . . .
No Wonder, Child, we prize the Hen,
Whose Egg is mightier than the Pen.

(Herford)

1. INTRODUCTION

Poultry keeping is widely practised in Malaya by all sections of the population. In fact there are few homes which do not keep a few birds, either kampong, foreign or cross-breeds, to obtain eggs and meat for home consumption or to augment a small income by their sale.

Poultry keepers in Malaya can be divided into four classes—(1) the smallholder who keeps a number of kampong birds either in conjunction with other livestock and vegetable gardening, or in his padi fields or around his house, (2) the 'backyard' poultry keeper, (3) the person who runs a large poultry farm as his sole occupation, and (4) the person who keeps foreign breeds as a hobby. In this booklet attention is given mainly to the first two categories but naturally most of the advice and comments apply equally well to all forms of chicken rearing.

Maintaining a small flock entails very little labour and the birds can easily be looked after by the women and children of the family. Most households in the country have some food left over after each meal which, with the addition of some bran, maize and padi, can be used for feeding poultry. Therefore it should be possible for most households, whether in kampong or town, to keep small flocks.

On the other hand it must be stressed that if the breeder is to be successful he or she must be prepared to give personal attention to the welfare of the birds. Neglect of the birds will result in failure and waste of money.

2. SYSTEMS OF POULTRY KEEPING

There are now several methods of poultry keeping which may be practised in Malaya. It is necessary to have at the outset a clear picture of the general plan which it is proposed to adopt in keeping poultry, and this plan will generally depend on the ultimate scale on which it is proposed to operate. The town dweller as a rule has little space at his disposal, whereas in the country several acres of land may be available. In the former case it is obvious that only a few birds can be kept unless the system of management is intensive. The country farmer, however, may have room for hundreds and possibly thousands of birds using either the whole or merely a part of his land. In practice, two or more systems are commonly used on the same holding; for example, chicks are frequently reared "intensively" until they are six or eight weeks old and then on "free range" until they are mature. Laying stock may be kept intensively either in flocks or singly in batteries. Breeding stock is normally run on free range or semi-intensively.

A poultry farm should preferably be situated on a slight slope where there is natural drainage and protection from strong winds. Marshy damp soil is fatal to fowls.

FREE RANGE SYSTEM

Free range poultry keeping can be adopted only where an adequate area of land is available to ensure either a low rate of stocking or rotational methods. In general, the average rate of stocking should not exceed 200 birds per acre. This system is used in Malaya, generally on a small scale when people in country districts keep up to 50 birds around their houses. There is always, however, a danger of disease spreading into the flock from outside sources. Dangers of disease and worm infestation from inside sources may be reduced if the birds can be moved from one area to another at intervals. As birds kept under this system are exposed to sunshine and also pick up quite a bit of food in the way of grass, snails and insects there is less chance of them suffering from lack of vitamins and minerals.

FOLDING SYSTEM

In this system the houses, with small runs attached, are portable so that they can be moved from one area to to another daily. The system has several advantages, one of which is that the birds are kept in small flocks and have fresh ground daily. This decreases the likelihood of disease and, if a disease should occur, the affected units are small and can easily be isolated. Although initial housing costs are heavy, no fences are required. Its main disadvantages are the relatively high cost of housing and the fact that depreciation with portable houses is heavier than with fixed ones. This system has not yet been thoroughly tested in Malaya but should have great possibilities in, for example, the running of poultry in areas of young rubber. Under this system as under the Free Range system the birds pick up some of their food from the ground. In the three following systems there is no access to fresh ground regularly so a 'balanced' ration must be fed.

SEMI-INTENSIVE SYSTEM

The consensus of opinion among poultry farmers in Malaya is that the semi-intensive system of poultry keeping is the most successful method. This system is ideal for breeding purposes. Each bird requires about 50 square feet of land in the poultry run; if so much land is not available sufficient scratching litter should be provided for exercise. The runs should be made of 2 inch mesh wire netting 6 feet high. If there are no shade trees in the run some shelter from the midday sun should be provided until trees are grown. The ground should be treated with lime and turned over at regular intervals to keep the land free from parasitic infestations. If sufficient land is available provide alternate runs so that the soil and grass on one run may be rested whilst the other is in use.

INTENSIVE SYSTEM

Under this system large numbers of birds can be reared in a comparatively small area. This is accomplished by keeping the birds totally confined to the poultry house. This system, however, has not been tried out extensively in this country. When this system is used it is essential that the birds be given a completely balanced ration containing all the vitamins and minor elements essential for growth and production. The main disadvantages of the system are that the capital costs of housing are high and that birds when kept in close confinment have a tendency to acquire vices such as egg-eating, feather-plucking and cannibalism.

DEEP LITTER SYSTEM

This is a modification of the intensive system. The birds are kept in confinement in houses the floors of which are covered with a litter of peat, sawdust or cut straw. Usually the floor is first covered to a depth of 4 to 6 inches, further litter being added later. This system effects great economy in labour, and in some countries it is conservatively estimated that one man can attend to some 4,000 birds. It has not yet been tried in Malaya on any appreciable scale but experiments are giving encouraging results. Birds should be well grown when put in the house. Further details of this system are given in Appendix 1.

BATTERY SYSTEM

In the battery system of egg production, layers are kept either individually or in small flocks in cages arranged in tiers. It may be described as a super-intensive system. Several advantages may be gained from this method. With the individual cages, owing to the complete control of individual birds, no bullying or interference when the birds are feeding can occur and diseases can be largely kept under control. Accurate records of individual egg-production can be kept, and so culling (removal of unprofitable birds) is simplified. This system, therefore, is probably the ideal one for the domestic poultry keeper and part-time poultry man. Small batteries containing 12 birds have been used successfully in Malaya, but no large scale trial of this system has been carried out. It is, of course, imperative that good rations containing all the necessary vitamins and minor elements be used. Only adult birds are used.

3. SELECTION OF BIRDS

A flock can be started with either adult birds or young chicks. While the purchase of adult stock entails more initial expenditure the rearing of young chicks requires more labour and skill. For the beginner who is not prepared to invest much money on adult stock it is advisable to start with a flock of kampong chicks about eight weeks old. Begin in a small way and gradually increase the stock when sufficient experience is gained.

Pure-bred foreign birds such as White Leghorns, Rhode Island Reds, and Australorps cost more to buy and require much more care and attention than do kampong fowls. Leghorns are light birds but good layers, while Rhode Island Reds and Australorps are larger birds meant for the dual purpose of egg production and meat supply. First crosses between a kampong hen and a cock of one of the above mentioned foreign breeds are satisfactory layers if well fed.

The beginner should seek expert advice on suitable birds for his purpose; for example he must decide whether he wishes to produce eggs, birds for the market, or even both by breeding dual purpose birds. Having decided on this point he has the following types of birds available in this country from which to select.

MALAY KAMPONG FOWL

In its original form it resembles the jungle fowl and is rarely found except perhaps in remote villages. It is essentially a table bird, egg production being about 50 very small eggs per year. It is a scavenger, very hardy and capable of surviving on very poor diet.

CANTON TYPE OF KAMPONG FOWL

It is a slightly heavier bird with shorter legs and characterized by yellow or buff plumage and golden legs. The pure bred is not often seen because of the continuous inter-breeding with the Malay Kampong Fowl and other breeds that has occurred over many years. Hens lay about 80 small eggs per year and cockerels make useful table birds reaching a weight of about 2 katties * in 4 months. Under good husbandry conditions egg production can be increased.

---

* 1 Kati = $1\frac{1}{3}$ lbs.

WHITE LEGHORN

This is the most common of the imported light breeds. It is essentially a breed for egg production and is non-broody. Its white plumage seems to be unpopular with a section of the local population though colour has no bearing on the economics of poultry keeping.

RHODE ISLAND RED

This is a very popular breed in western countries. It is a dual purpose bird. The cock weighs about 8½ lbs. and the hen 6 lbs.

AUSTRALORP

This is an Australian breed, and is even heavier than the Rhode Island Red. It is also dual purpose. It is black in colour.

Imported pure bred fowls when kept under good management and well fed are superior to the indigenous birds in their capacity for laying, body weight, egg weight and in their looks, but these birds lack the vitality to withstand the climate of Malaya. Experience has shown that these birds deteriorate from generation to generation when bred in this country unless the expensive system of introducing new "blood" into every new generation is practised. Under ordinary village husbandry conditions these pure breeds are very unproductive. They have less resistance to diseases than the local birds. Therefore it would appear that introduction of foreign birds into the country is not the solution to the problem of improving the national poultry industry.

The solution appears to be either in selective breeding within the indigenous fowls, cross-breeding the indigenous fowl with an imported pure breed or in up-grading the indigenous fowl. These methods of improvement cannot be explained in a booklet of this size and those interested in such methods are advised to consult an expert.

4. HATCHING OF EGGS

Hens can lay eggs without the assistance of a cock, but such eggs are infertile and cannot be hatched. To obtain fertile eggs a cock should be provided for every 10 to 12 hens. The cock must be active.

Eggs can be hatched by the natural method under a broody hen or artificially in an incubator. The eggs should be taken from healthy birds. The eggs must be large, for large eggs produce large chicks. Do not hatch small, badly shaped, porous-shelled, cracked or dirty eggs, or eggs which are abnormally larger than the average size for the breed. Eggs for hatching must not be washed but any patches of dirt should be scraped off with a knife. The eggs should be stored in a cool room in baskets and be turned once daily while being stored. Do not hatch from eggs older than 8 days.

If it is decided to use a broody hen, set 9 to 12 eggs depending on the size of the hen and the eggs. The eggs should be placed in a clean box or basket with straw or wood shavings at the bottom to form a nest. An insect-killing powder sprinkled on the straw will keep fleas off the hen. The hen should be fed outside the box twice a day. Hen eggs take 21 days to hatch, but they start chipping on the 19th or 20th day. The baby chicks should not be moved from the box for about 36 hours, by which time the feathers will be dry.

Poultry keepers who intend using an incubator for hatching eggs are advised to study one of the books written on the subject, or to seek advice from an expert.

5. REARING OF CHICKENS

A great deal of the success in poultry farming depends on how young chicks are reared during their growing period. To prevent undue mortality among young birds, and to improve their growth and vigour, a systematic programme is desirable from the start. **The degree of success achieved depends on the quality of the chicks and the methods of feeding, housing and management. The following points are important:-**

(a) If day-old chicks are bought from a hatchery or market choose large and vigorous ones. They must have bright eyes, strong legs and dry fluffy feathers. The vent should be dry. The umbilicus should be clean and healthy and the yolk sac properly absorbed.

(b) Day-old chicks are best looked after by a *foster-mother hen.* A good hen will take 15-20 chicks. If a larger number of chicks is to be reared artificial brooding has to be resorted to (see page 17). Let the intended *foster-mother hen* sit on a few eggs for a day or two and then quietly slip the day-old chicks under her at night, at the same time removing the eggs. She will then 'adopt' the chicks.

(c) Keep the newly hatched chicks on the nest with the hen for 36 hours. They need no food during that period. Then transfer the hen and chicks to a coop or put them under a chicken basket. The coop should be made so that the chicks can run in and out at will, but the hen should remain inside. In kampong conditions a satisfactory coop can be made by opening up a few sections of bamboo to form a cone through which only the chicks can escape. When the chicks are over one week old allow them to run around with the hen outside. **Do not, under any circumstances, let the young chicks get wet.**

(d) Always keep the coops, houses and ground clean and free from fleas and ticks. The coops and houses should be well ventilated and not be overcrowded; faulty ventilation and overcrowding retard growth and spread diseases. It is essential that chicks be reared on clean ground; therefore coops should be moved as often as possible, at least once weekly. Do not keep chickens on soft damp ground.

(e) Separate the sexes as soon as they are recognisable. If the main object is egg production dispose of the cockerels or rear them separately. It is profitable to caponise cockerels. (See Section 11).

(f) Poor "doers" and sickly chickens will never grow up to be healthy, strong and productive birds. They are an economic liability. Get rid of them.

(g) Separate chickens from the mother hen when they are about eight weeks old, but do not pen them with older birds as the older birds will bully them, particularly at feeding time.

(h) Take precautions to prevent losses caused by hawks, other birds and rats.

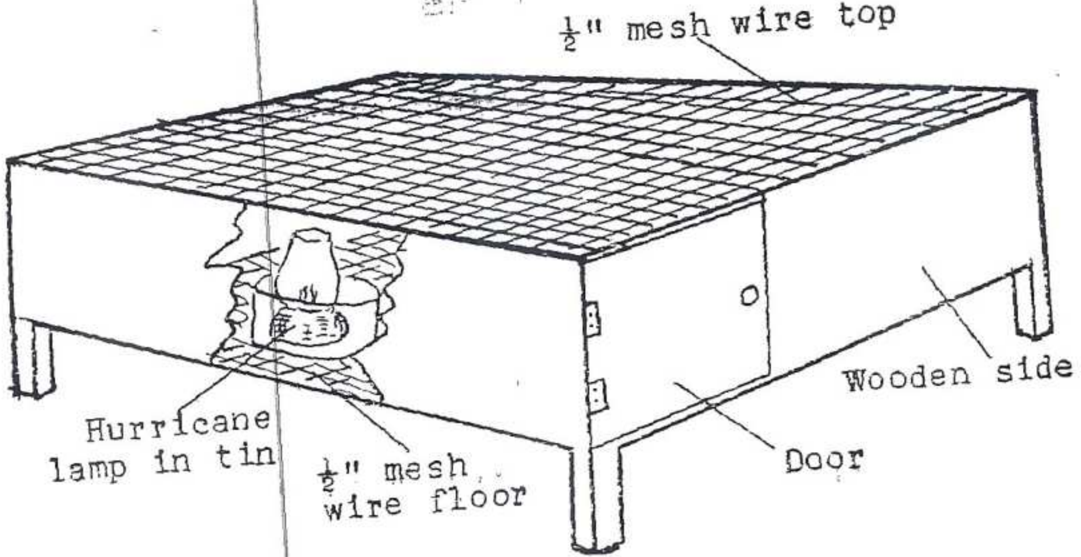
ARTIFICIAL BROODING OF CHICKS

Artificial brooding is the rearing of baby chicks without the aid of a hen. It is usually done by means of a heated brooder. Artificial brooding is recommended where a large number of chicks are to be raised, as mother hens can only care for a limited number. This method is more labour saving and economical when handling large numbers of chicks bought from hatcheries or hatched in an incubator.

Artificial brooding can be done in a box if the number of chicks is comparatively small, or in a room if the number is large.

Box Method

The box may be made of wood, with ½ inch wire mesh floor and top. Rearing chicks on a wire floor helps to keep them free from parasites. The height of the box should not be more than 1½ feet; a box of about 8 inches high will be less draughty than a higher box. A door should be provided at one side.



A SIMPLE ARTIFICIAL BROODER

The minimum floor space required for each chick in a brooder is 36 square inches. A box 4 feet by 4 feet will therefore take about 60 chicks. Old paper or gunny sacks should be spread on the floor of the box for the first fortnight and changed daily. It is advisable to leave a space of one inch, all round the floor at the sides of the box, uncovered for better ventilation. The box should be placed in a well ventilated but draught-free room and raised 6 inches from the ground. The droppings can be caught in a tray fixed below the netting floor or else sand or sawdust can be spread on the room floor below the box to make cleaning easier. Baby chicks require some warmth during their early life; this may be provided by placing an ordinary hurricane lantern or an electric lamp in the middle of the box with a tin or wire guard around it. The guard will prevent the chicks getting too near the lamp and scorching themselves. A piece of tin placed above the lamp reflects more heat and lessens the risk of fire. For the first few days the temperature in the brooder should be 90°F. but reduced gradually as the chicks grow older. Heat should be provided day and night for the first week or ten days, but for the next fortnight only during the night. After this, on cold nights, the top of the box may be partially covered with cloth until the chicks are six to eight weeks old. Care should be taken to keep the cloth from the lamp to prevent fire. Lanterns should be lighted before nightfall or the chicks will huddle together in corners. Overheating and chilling of the brooder must be avoided. In areas where mosquitoes abound the chicks benefit if the box is surrounded by mosquito netting.

By the end of the first week, and possibly earlier, the chicks indicate by their activity during the day that less heat and more space is required. For this latter purpose, the outfit includes not only the brooder but also a "carry-on cage", 9 feet x 3 feet and the same height as the brooder. The chicks can be admitted to the cage through a pop-hole in one side of the brooder box. The first portion of the cage has a wooden floor, the remainder has a floor of ½ inch were netting. The sides are similarly of wire netting. The chicks are allowed to use the solid floor for a few days and are then encouraged to use the wire floor by placing food and water on it. The cage is exposed to the sun for an hour daily.

Room Method

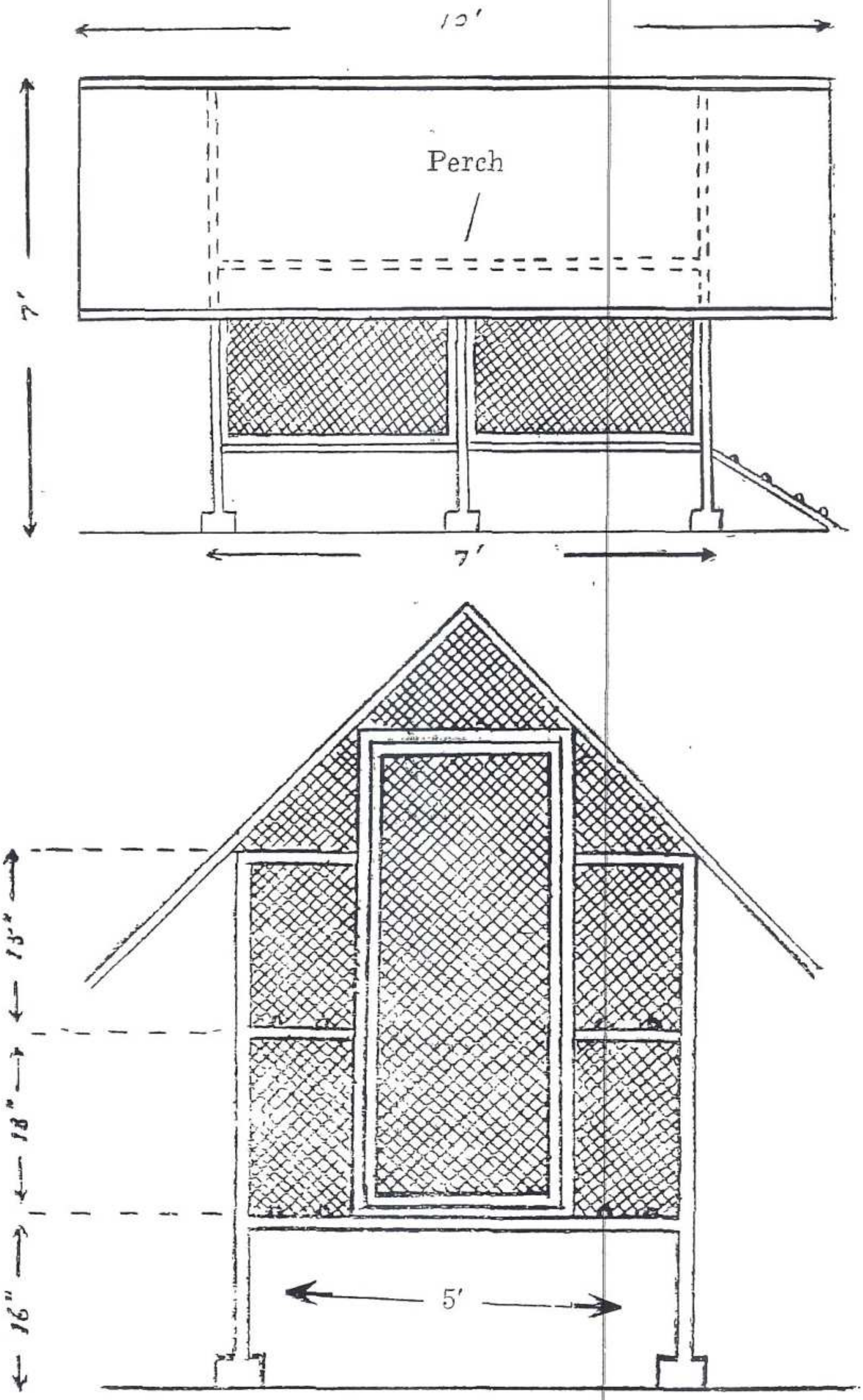
If a large number of chicks are to be reared they may be brooded in a well ventilated room free from draughts. The windows should be 4 feet from the ground. In order to prevent draught the windows should be fitted with louvres to deflect the airstream upwards; if this is difficult the windows on the windward side should be closed. Litter, consisting of padi husk, wood shavings, dry sawdust or clean dry sand, should be spread on the ground half an inch deep. The litter should be renewed once a week. The room may be heated with the aid of a few lanterns or electric lamps. The lanterns should be raised from the ground to prevent the litter catching fire. Low perches should be fixed on the sides of the room when the chicks are well feathered; these will prevent overcrowding on the floor at night. The chicks may be removed from the brooder when they are six to eight weeks old.

6. HOUSING

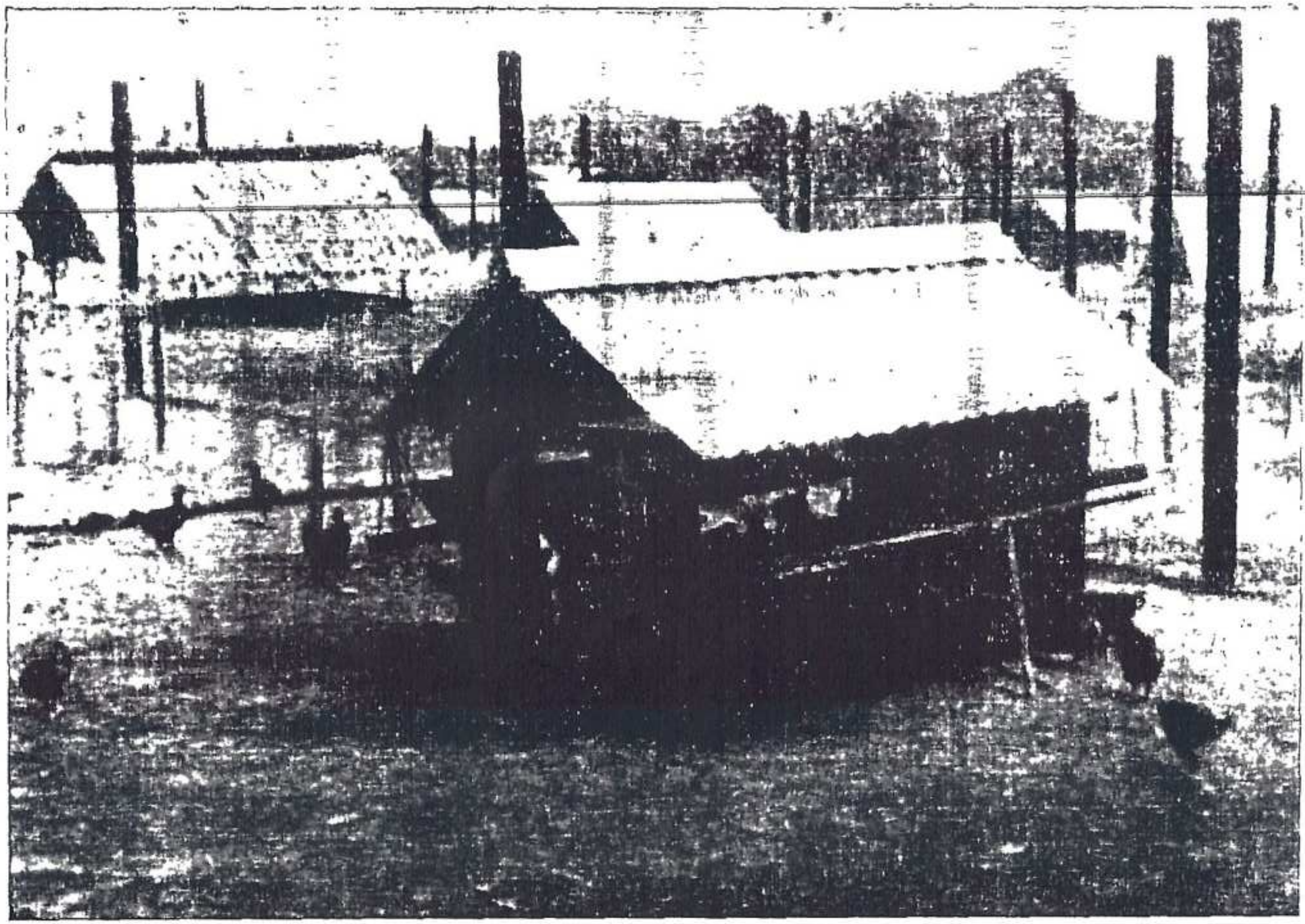
In Malaya the housing of poultry can be very simple. All they require is shelter from rain and draught, and protection from wild animals including rats. The house should admit plenty of fresh air and sunlight as fowls will not thrive in stuffy surroundings.

The Range Shelter (see illustration) has been found to be very suitable in this country.

SKETCH OF RANGE SHELTER

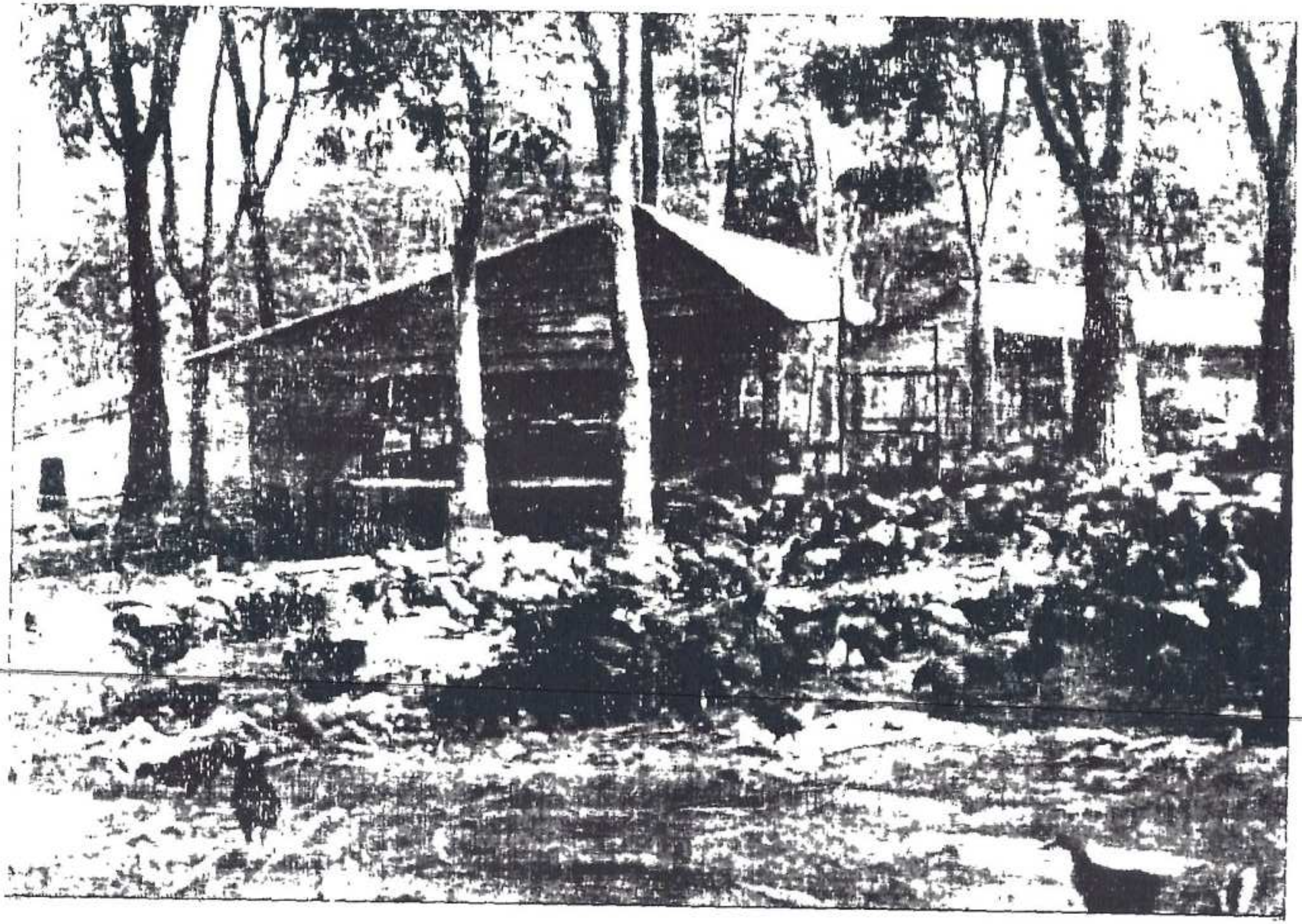


PLATE



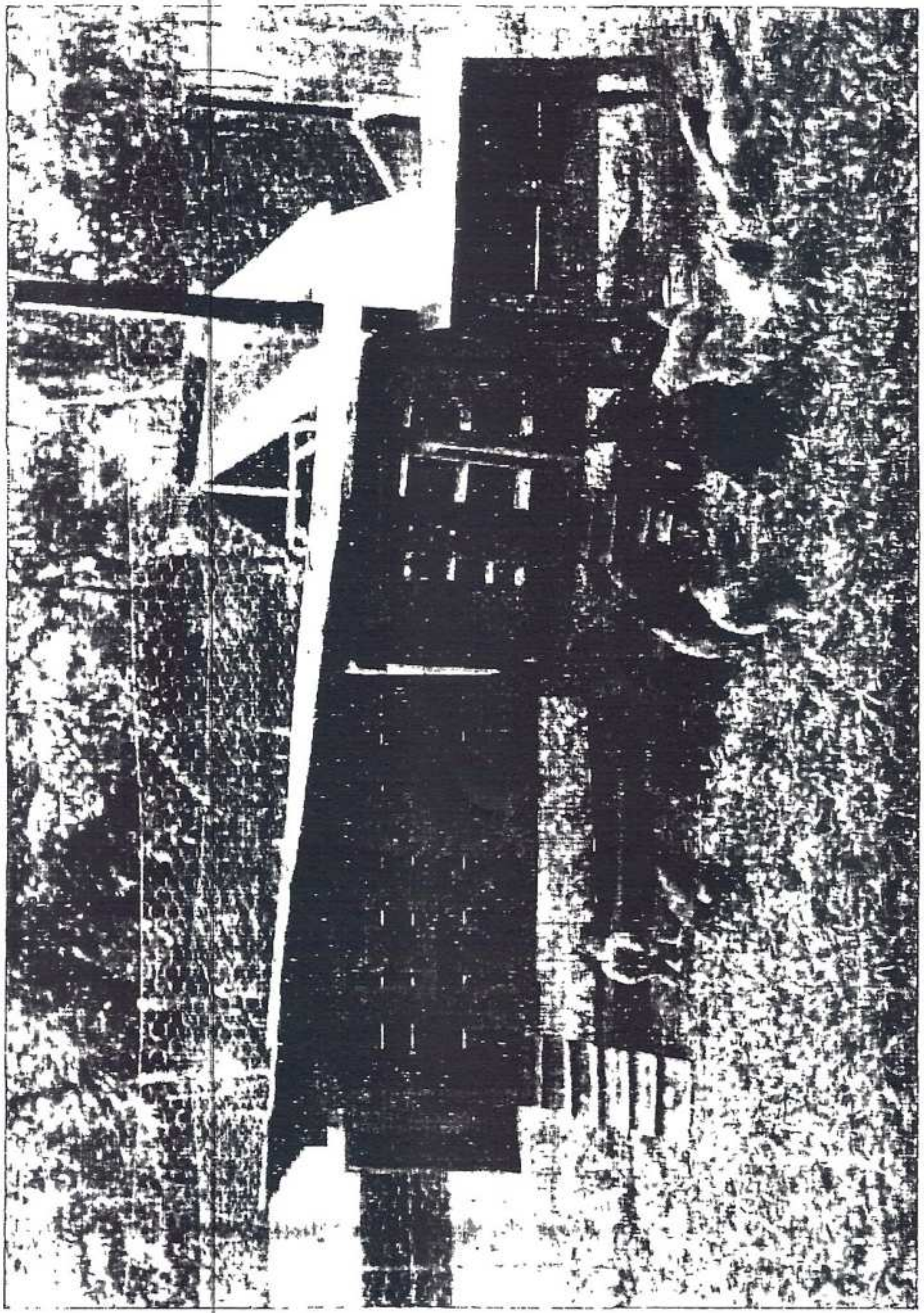
The modified Night Ark.

PLATE



A cheap house for a large flock.

PLATE



A small house made from packing cases.

A house 7 feet by 5 feet will accommodate about 15 adult birds. Each adult bird requires about 2 square feet of floor space. The floor may be either wooden slats or ½ inch mesh wire netting through which the droppings can fall to the ground. The walls should be ¾ inch mesh wire netting all round. The roof may be made either of asbestos sheets, corrugated aluminium or galvanised iron sheets. Attap, although cool, tends to harbour vermin and does not last long. The shelter should be rat-proof when completed. There should be ample perching space, allowing about 10 inches for each bird. Perches may be made from strong wood 2 inches wide, with the top edges rounded off, and should not be placed higher than 18 inches from the floor. The woodwork is painted regularly with tar, *wood preservative* or old used car engine oil in order to preserve the wood and kill vermin. The Range Shelter is best raised one to two feet from the ground. The droppings should be removed at least once every week. In order to stop the birds scattering the droppings and to enable the manure to be collected in a dry state the ground below the house may be enclosed by wire netting nailed to the legs of the shelter. Lime spread under the house will help to keep the ground sweet and control disease.

The Night Ark which was evolved at the College of Agriculture, Serdang, has also been found to be very suitable and cheap to construct. During the day when it is open the Ark serves as a shelter and when closed at night it becomes a comfortable house.

A "Packing-Case" House for those who wish to start in a small way is simple and cheap. Take a large wooden packing case; replace one side and the floor with wire netting (¾ inch mesh); make a door at one side; place one or two sheets of aluminium on top of the box and tie them down with wire; raise the whole box 1 foot off the ground by placing on bricks or legs; paint the woodwork with three coats of used engine oil. Such a house might last about five years and is easily moved about on the land.

A House for Larger Flocks is shown in the photograph.

If the birds are kept in a fowl house with a cement or concrete floor a thin layer of clean dry sand should be placed on the floor. The sand should be renewed weekly.

The necessity of cleanliness in poultry houses cannot be over-emphasised.

For advice on houses for the Deep Litter System the reader is referred to Appendix I.

7. FEEDING

BALANCED FEEDING

A sound knowledge of poultry feeding is essential for the economical running of a poultry farm, whether it be big or small. The food must be cheap and at the same time wholesome. The objects of feeding are to maintain the body of the fowl in a normal healthy condition and to provide for the production of eggs and meat. The food must be 'balanced', meaning that it should contain the correct proportions of carbohydrates, proteins, minerals and vitamins. It is now possible to purchase such 'balanced' poultry feeds ready made up from reputable fodder merchants.

Carbohydrates are found in abundance in cereals such as rice and maize; they are a source of energy for the fowl's body and for the production of fat. Excess cereals should not be fed to laying hens.

Proteins are utilised for the repair of worn-out tissues of the body, for the development of flesh and feathers, and for the production of eggs. Fish meal, meat scraps, milk, groundnut cake and soya-bean cake are rich in proteins. Animal proteins, for example fish meal and meat scraps, are superior to vegetable proteins. Growing chicks and laying hens require a diet very rich in proteins.

Minerals in adequate supply are essential for health. Calcium is needed particularly for the formation of bones and the shell of eggs. Minerals are found to some extent in normal poultry foods, but limestone grit, oyster shell or chalk should be added to give sufficient calcium to the diet.

Common salt, not exceeding one part in a hundred parts of the total ration, must be added except when the ration includes a good proportion of fish meal.

Vitamins are necessary to preserve health, promote growth and induce good hatchability of eggs. Vitamins are normally present in the common foodstuffs and in green leaves and grass, but red palm oil or cod liver oil fed in small quantities to chickens are also useful to ensure a sufficiency of Vitamin A necessary for their growth.

Successful feeding does not depend entirely on the use of balanced rations; the method of feeding is as important as the actual rations fed.

It is difficult to lay down rules as to which foodstuffs are to be used in order that the poultry keeper can feed a balanced ration. The policy adopted in this booklet is therefore aimed at:

(1) giving a scheme of feeding for chickens, growers and layers using common foodstuffs;

(2) giving details of the type of mashes which can be made up at home or bought ready mixed from reliable merchants;

(3) giving suggestions for using household scraps to produce a cheap ration for backyard poultry keepers.

A few alternative rations used in certain localities because of availability of the foodstuffs are detailed in Appendix 2. It should also be remembered that rations put up in the form of pellets can also be purchased on the market.

FOODSTUFFS

The supply and availability of the various foodstuffs which can be used for feeding poultry vary in different parts of the country and full use should be made of locally produced foodstuffs, market waste and by-products. In districts near ports and towns imported foodstuffs can be bought easily, for example:—oats, oat-meal, wheat, maize, ready-mixed rations, fish meal, dried milk powder and groundnut cake. In rural areas there may be available:—padi, rice bran, grated sago pulp, grated or 'scraped' tapioca, fresh coconut (grated or split open), sweet potatoes and fish.

There is a variety of green foodstuffs which can be used when finely chopped, for example:—grass, kangkong, cabbage ("kobis"), sweet potato leaves, and "bayam". A special grass called "guinea grass" can be grown.

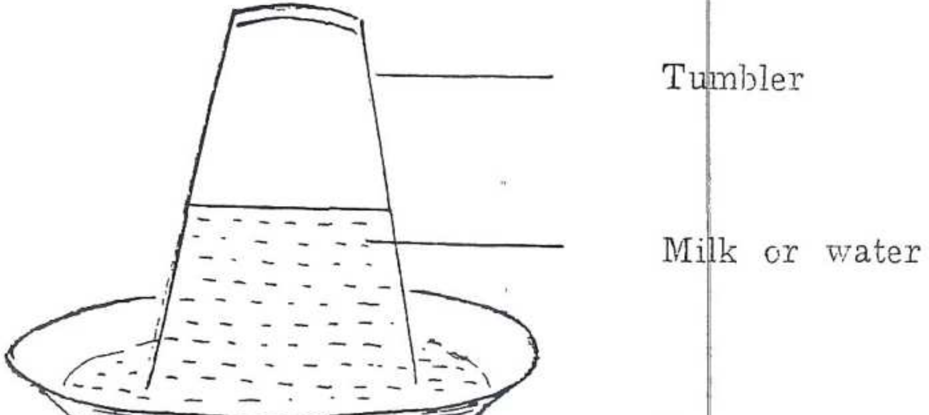
Animal Feed Supplements

Although not a foodstuff this substance is now used by many poultry keepers to increase the rate of growth of their chickens. It contains an "antibiotic", such as aureomycin or penicillin, and vitamin B_{12}. It is sold under different trade names. The powder is mixed with the food. Poultry keepers who have not so far mixed this supplement in their rations should ask an expert for advice before doing so.

FEEDING OF CHICKENS AND GROWERS

Water or Milk

Water or milk for drinking is essential. If it is available they should be given skim milk to drink until they are about 6 weeks old. Skim milk powder is sometimes obtainable. Pour the milk or water into a tumbler, place a saucer turned upside down over it, and then turn the tumbler and saucer over. The tumbler will now stand topside down in the saucer, and there will be a rim of milk or water all round in the saucer sufficient for the chicks to drink without any danger of their drowning themselves or getting wet (see diagram). The water or milk provided must be clean, changed every day and placed in a cool shady place.



Food

The early stages of growth are most critical in the life of a fowl, and it is during this time that the biggest losses due to malnutrition or faulty feeding occur.

Method of Feeding

The following method of feeding is recommended:—

First 36 hours. During the first 36 hours of life the young chicks require no food but water may be provided after 24 hours.

The next 2 days. They should be fed on fine oatmeal only. This may be scattered on a sheet of newspaper or on a board. The mother hen should be fed apart from the chicks. The chicks should be fed 5 to 6 times a day, a little at a time. If oatmeal cannot be obtained stale bread-crumbs moistened with milk, or very finely broken rice and bran may be used. Finely cut grass should be available at all times from now on.

4th to 7th day. A little finely broken rice and bran should be fed with the oatmeal. 12 chicks will eat about 1½ ounces of food a day at this stage. If milk powder is available a little, say 1 part to 4, should be added to the oatmeal from the second to the seventh day.

1 week to 10 weeks. Feed a suitable **chicken mash** dry in troughs. It should be available at all times. Feeding grain such as yellow maize (broken) and broken rice should be started in this period. Chicks up to 10 weeks will eat about ½ ounce mash and ½ ounce of grain a day.

10 weeks to 22 weeks. The change over from chicken mash to **grower's mash** should be made gradually between the 9th and 12 week. The grower's mash should be given wet, but not sloppy, in a trough morning and evening. **Grain** such as padi or broken maize is given scattered on the ground in the evening. Each fowl will eat about 2 ounces mash and 1½ ounces grain per day.

FEEDING OF LAYERS

The change over to **layer's mash** should be made gradually. Pullets usually start laying when they are about 6 months old so it is advisable to start feeding layer's mash when they are about 5½ months old. Some birds come into lay later depending on the breed and locality; such flocks should be started on this ration 2 weeks before they are expected to start laying. The mash should be fed wet in a trough morning and noon. **Grain** such as padi or broken maize is given scattered on the ground in the evening. The actual amount of mash and grain the birds will eat can be learned from experience, but as a guide it can be estimated that each laying hen will eat about 2 ounces mash and 2 ounces of grain daily.

GREEN VEGETABLES, LIME AND VITAMINS

In addition to food in the form of mash, grain or pellets it is essential to provide green foodstuff and limestone.

Green vegetables such as kangkong, sweet potato leaves or grass should be given daily. This is essential when the birds are confined in houses. For chickens the vegetables or grass should be finely chopped.

Limestone grit or ground oyster shell should be available in a small box always, so that the birds can eat as much as they desire.

If the birds do not get sunshine, feed palm oil or cod liver oil if these are not mixed in the mash already.

THE MASH

Below are sample rations which have proved satisfactory:

A. **Ingredients**	**Chickens**	**Growers**	**Layers**
	(All parts by weight)		
Broken rice	35	45	40
Yellow ground maize	20	15	25
Rice polishings	15	15	15
Coconut cake	10	19½	14
Skim milk powder	7	—	—
Fish meal	7	5	5½
Yeast	3	—	—
Ground limestone	2	—	—
Salt	1	½	½
Red palm oil	2	2	2

B. **Ingredients**	**Chickens**	**Growers**	**Layers**
	(All parts by weight)		
Rice bran, 1st Quality	40	45	35
Yellow ground maize	30	40	35
Fish meal	20	5	15
Oat meal	10	—	—
Groundnut cake (decorticated)	—	10	15
Red palm oil or cod liver oil	2	2	2
Bone meal or chalk powder	2	—	—

C. **Please see Appendix 2.** As explained earlier it is necessary for the person making up balanced rations to consider the price and quantity of the different foodstuffs available. When in doubt, ask for advice.

Feeding on Household Scraps

A cheaper wet mash suitable for birds on free range can usually be made from household scraps. In most households, scraps of rice. vegetables, the heads, tails and bones of fish, and occasionally of meat and meat bones are left over after each meal. Any waste of this nature can be converted into poultry food. The scraps should be choppel up into small pieces (discarding the fat from meat scraps), thoroughly mixed and fed immediately. Scraps should never be kept for more than 12 hours before use; if they are kept any longer, care must be taken to eliminate any decayed material which is harmful. When preparing food from scraps the mixture, if 'sloppy', should be dried off by adding a small amount of rice bran (not husk) or rice polishings. These products possess considerable nutritive value and their addition to any scrap mash is therefore to be recommended.

The following is a rough indication of the proportions in which scraps should be mixed:—

Fish or meat scraps	....	1 part by weight
Vegetable scraps	....	1 ,, ,, ,,
Rice or potato scraps	....	4 ,, ,, ,,
Rice bran or polishings	....	1 ,, ,, ,,

About 3/4 tahil * per bird is all that can be consumed at one meal.

If grass is scarce, chopped up green foods may be fed in small quantities with advantage, as may small quantities of fresh shredded coconut meat. The latter contains a considerable proportion of oil, however, and the use of such foods should be restricted as otherwise the birds become too fat, with consequent lowering of egg production.

---

* 1 tahil = $1\frac{1}{3}$ oz.

Whether using a scrap mash or the balanced rations as wet mashes mentioned previously, the mash is fed in the morning or both in the morning and at midday, and an evening meal of grain is necessary some time before dusk. Grain digests slowly and the evening meal will keep the flock satisfied through the night.

8. MANAGEMENT

The proper management of the flock at all stages is of vital importance in obtaining good results.

Fowls need constant attention. Cleanliness in everything is essential. They need good housing, sufficient good food and plenty of clean drinking water. They also need sufficient exercise.

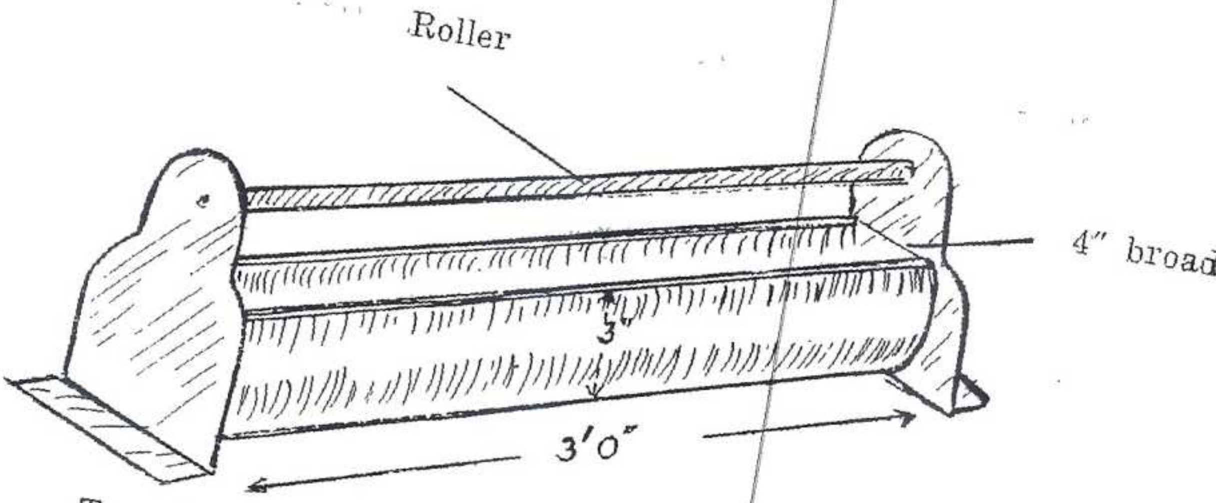
INSPECTION

The flock should be inspected at least once daily, paying particular attention to the presence of sick birds. The sick birds should be isolated and dead birds removed immediately. Expert advice from your Veterinary Officer should be sought if the death rate is abnormally high.

All birds should be handled at regular intervals and their general condition examined. Poor weakly birds should be got rid of; they are not worth keeping. Laying hens, if fat, will not lay well; their supply of grain should be cut. Examine the birds for vermin.

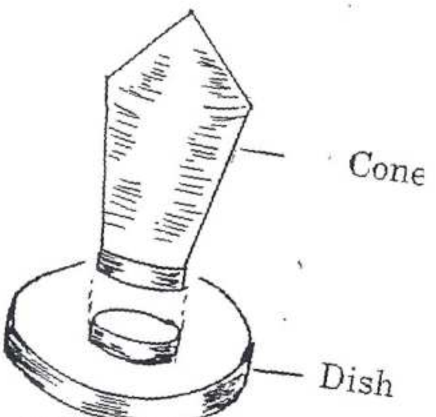
FEEDING

There must be ample trough space for food or the weaker birds will not get enough to eat. The troughs should be constructed in such a way as to prevent the birds getting into them. A revolving bar on the top will do this.

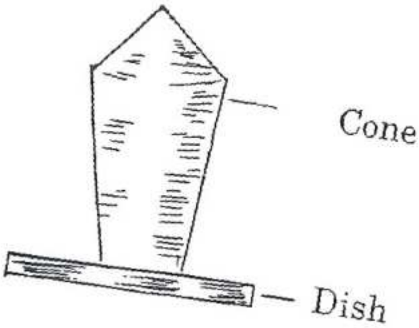


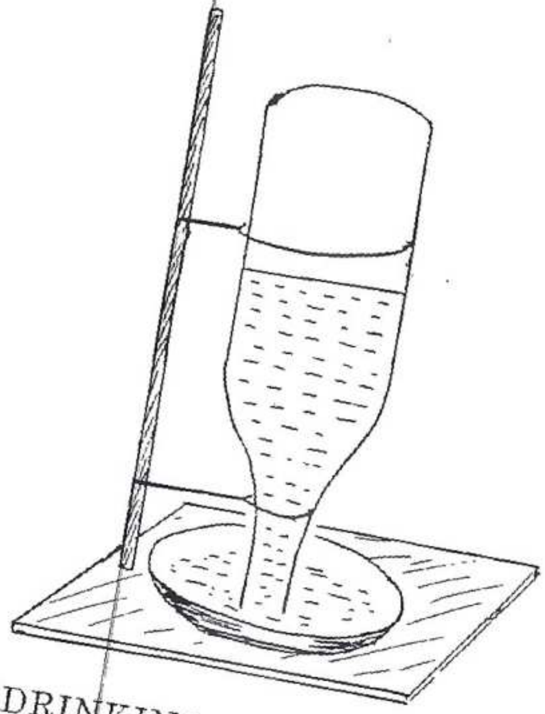
Trough made of tin or bamboo with roller on top.

The troughs should be cleaned daily and the old food thrown away. Food should be clean and fresh. New mash should not be mixed with old as old food becomes sour and causes digestive troubles. Any change in food or system of feeding should be gradual as a sudden or immediate change will upset the birds.



DRINKING FOUNTAIN
(MADE OF TIN)
Fill cone with water. Fit dish on top of cone and turn over.





DRINKING FOUNTAIN MADE FROM A BOTTLE.

DRINKING WATER

Drinking water is best supplied in a fountain or bottle (see illustration). This method ensures that the birds get clean water. Care must be taken to prevent birds drinking dirty water or water which has been sprayed with anti-malarial oil.

The fountain or bottle should be placed in the shade and cleaned out every day. Fowls need large quantities of water; for example, 10 laying hens will drink about 4 pints daily.

LAYING BOXES

Wooden boxes 18 inches square should be placed in the corners of the house for the hens to lay in. Alternatively, the laying boxes may be placed under a simple lean-to shelter. One box will do for three or four hens. Clean sand or straw should be placed in the box. The sand or straw should be renewed at regular intervals. Eggs should be collected daily and stored in baskets.

SAND BATH

It is a good thing to provide a sand bath in each pen. This is done by filling a box with clean sand mixed with a little sulphur powder, wood ash and tobacco dust. The dust bath will keep away vermin and the fowls love the bath.

BROODY HENS

Broody hens, unless they are required for sitting on eggs, should not be allowed to sit in the laying nests. If allowed to remain broody they will go off lay for a long time. If they are put under a chicken basket in the open they will get over their broodiness in 4 or 5 days.

SITE

The essential points in selection of a site for the poultry run have been noted in sections 2 and 5. Some poultry keepers have increased the production of fruit crops such as rambutan and coconut by running the birds under these trees. This type of management might be useful where conditions are suitable.

9. IMPROVEMENT OF STOCK

In most flocks in Malaya which are kept for the production of eggs, it will be found that most of the eggs are laid by a few birds and that many birds are unproductive. Yet the unproductive birds are probably eating as much as those regularly in lay. A common attitude is that one bird does not matter and can be removed at any time. Yet regular and systematic discarding of unprofitable birds will make all the difference between economic success and failure. This systematic discarding of unprofitable birds is known as *culling;* it should be continually carried out throughout the whole life of the birds.

INDIVIDUAL RECORDS

The exact number of eggs that any individual bird lays can be determined if the birds are trap-nested. Trap nesting entails a good deal of labour and needs careful record keeping. A good poultry-man can tell by looking at and handling the birds whether they are profitable or not and the way to learn how to do this is to look at and handle birds whose production has been individually recorded, comparisons being drawn between known good and bad birds until efficiency is achieved.

GOOD AND BAD LAYERS

The following differences between layers and non-layers are apparent when the birds are observed closely:—

Layers	Non Layers
Large, fully-developed red combs and wattles.	Small shrunken, undeveloped pale combs and wattles.
Feathers beginning to look worn and dry.	Usually very clean, new looking feathers.
Large full bodies for the breed with the body muscles extended so that the breast bone slopes down towards the ground.	Shrunken or undeveloped bodies with the muscles contracted so that the breast bone slopes up towards the tail.
Yellow-fleshed breeds may have white or pale beaks and shanks according to the length of time they have been laying.	Yellow-fleshed breeds have yellow beaks and legs.

Further, the differences will be seen when the birds are caught but this must be done gently. If the birds are frightened they will stop laying and this is especially the case with light breeds. Heavy breeds are easier to handle. The best way to catch the birds is to shut them all inside the house, to place a special catching crate over the exit and to deal with them one by one.

When the birds are handled, the following differences will be found:—

Layers	Non Layers
A large, moist, oval vent.	A small, dry, round vent.
Widespread pelvic bones. (room for 2-3 fingers).	Closed pelvic bones (1 finger).

Layers	Non Layers
A thin, pliable pelvis.	A thick, stiff, pelvis, often covered with fat.
A good abdominal capacity, with room for 3-5 fingers (according to breed and rate of laying) between the pelvics and the end of breast bone.	Very small capacity, with room only for 2 fingers.
A full abdomen, denoting a full-developed ovary, oviduct and digestive system.	Empty and undeveloped abdomen.
Soft, loose skin of fine quality with absence of hard body fat.	Thick, coarse skins with layers of hard abdominal fat and/or tissue.
Yellow-fleshed breeds will have lost their yellow pigment and will have white vents, eyelids, ear-lobes and probably white beaks and legs.	Yellow-fleshed breeds will have yellow vents, eyelids, ear-lobes, beaks and legs.

A SIMPLE METHOD OF CULLING

Probably the easiest method of culling flocks, in Malaya, is to inspect them every month or two and to put a coloured ring on all birds which are in lay at the time of inspection. Over a period of six months or a year all birds which have not got four or five rings are probably unproductive and should be discarded.

10. POULTRY KEEPING MUST BE ECONOMICAL

To make poultry keeping a paying concern the following factors are essential:—

(1) The poultry keeper must be keenly interested in chickens. He must have the ambition to succeed, be mentally alert and have good judgment. He should be hardworking, and possess a good knowledge of the market. He must constantly supervise his labourers if any are employed.

(2) The cost of producing poultry and eggs must be economical. The capital outlay must be kept to the minimum requirements without affecting efficiency. The feeding costs should not exceed half of the total expenses for the production of poultry and eggs. The poultry keeper should try to get a good knowledge of the nutritional requirements of poultry and obtain good food at the cheapest rates.

(3) The mortality of chicks and adult birds must be cut to a minimum by good management. Bad "doers" are uneconomical to keep and should be culled.

11. MARKETING

The best use should be made of the poultry and eggs which are surplus to requirements for the home. There is also some money to be made from selling poultry droppings as manure for gardens and fruit trees.

Surplus cocks should be sold for slaughter when they are about 4 months old.

A male bird which is made sex-less by using a drug or removing the testicles is called a *capon.* The cocks then lose their male appearance, do not crow and cease to bother the hens. Cocks which have been *caponised* will be fatter and heavier, will fetch a better price than ordinary cockerels. Cockerels can be *caponised* by getting an officer of the Veterinary Department to inject them with a special drug 6 weeks to 2 months before they are to be sold. The operation is simple, cheap, and there is no risk of death and no check to the growth of the bird. Using this method it is possible to sell *caponised* birds one month earlier than when done by the surgical method. Birds are usually injected when they are 2 to 2½ months old. They fatten very well by feeding liberally on sweet potatoes, or other food rich in carbohydrates, for the next 6 to 8 weeks.

As hens become old or their egg production falls below a reasonable standard they should be fattened, sold off and replaced with pullets. Such hens can also be injected like cockerels so that they will fatten better.

It should be remembered that poultry dealers will be keener to buy birds which have been vaccinated against Ranikhet disease and which appear strong and healthy.

Eggs should be collected daily and sold within 5 to 7 days. The eggs must be kept in a cool place in a basket.

Dirty, cracked or soft shelled eggs should not be sold. Dirty eggs should not be washed. Clean eggs can be obtained by keeping the nests clean.

Eggs should be carefully packed to reduce breakages during transport.

By observing these few simple rules a poultry keeper can build up a reputation for reliability which will enhance the value of his produce.

12. DISEASES

The following points should be observed in order to safeguard the health of fowls:—

(1) Cleanliness. The house, run and utensils should always be kept clean. Clean food and water are very important. Birds should not be allowed to drink water which has been sprayed with anti-malarial oil or otherwise contaminated, for example by dead birds or animals.

(2) Do not introduce new bird's into the flock until they have been isolated for 10 days. Poultry markets are usually a source of infections of many kinds. Fowls bought in markets for the table must be killed away from the poultry-run and their blood, feathers and entrails burnt or deeply buried.

(3) All sick birds should be immediately isolated pending expert advice and their houses and runs disinfected. All dead birds should be buried or burnt and not, for example, thrown into a drain or ditches. Do not restock infected premises for one month after a serious disease.

The more important diseases of poultry in this country are Ranikhet disease, fowl pox, infectious coryza, infectious laryngo-tracheitis, fowl cholera, gape worm infection, eye-worm disease, and intestinal parasitic infestations.

The following notes are not exhaustive; they are only a guide and it is best to consult the nearest Veterinary Officer for diagnosis and help. Before home treatment is attempted it is advisable to consult your Veterinary Officer. He will, if necessary, send material for further examination to the Veterinary Research Institute at Ipoh.

THE SULPHA DRUGS

A few notes about the *sulpha* drugs will be helpful as drugs of this group are widely used in the treatment and control of certain poultry diseases. These drugs are classified as *poisons* and they should only be used on the advice of a Veterinary Officer, at least until some experience is gained in their use. The disease you are treating must be diagnosed first so that treatment will not interfere with laboratory methods if these have to be used later.

Sulphadimidine sodium is one of the most effective drugs. It is sold under various trademarks such as "Sulphamezathine", "Sulphamethazine" or "Sulmet". The drug should not be given for more than 5 days at a time. The dilution of "Sulphamezathine" 16% is 2 ozs. in 1 gallon of drinking water while for "Sulmet" 1⅜ ozs. in a gallon of drinking water is reccmmended. This drug is used for fowl cholera, coccidiosis, coryza, etc.

Sulphaquinoxaline drugs such as "Embazin" are also useful in coccidiosis but more care in their use is required. The dilution recommended is 1 oz. in one gallon of drinking water.

Sulphathiazole ("Thiazamide") is used in infectious coryza. In adult birds the dose is a half tablet first dose followed by a quarter tablet three times daily but for birds under three months the dose should be a quarter tablet three times daily for not more than five or six days. A form of this drug "Avisol" can be added to the drinking water—50 c.c. in one gallon of water.

The correct dosage of whichever preparation is used should be checked carefully before the drug is used.

Ranikhet Disease (Newcastle Disease, Fowl Pest)

This is the deadliest poultry disease seen in this country. It usually causes 90 to 100% mortality when it occurs in a flock.

An infected bird is drowsy and depressed and often stands about with its beak open, gasping for air. There is usually a greenish-white diarrhoea. There may be tiny white patches on the lining of the inside of the mouth and throat. Usually several birds are affected at once and within a few days nearly all the birds in a flock become infected. Most of the birds die within a few days. Any survivors are frequently left with paralysis of the legs or a twisting of the neck.

Preparation of Ranikhet vaccine. Veterinary Research Institute, Ipoh.

Treatment

There is no cure for this disease.

Prevention

An excellent vaccine, which has been used in Malaya since 1947, is, however, available as a preventive measure. This vaccine confers an immunity against the disease for about 2 years. Vaccinated birds need not be injected a second time within two years. Several million fowls have been vaccinated in the country with very satisfactory results. Chickens above the age of six weeks can be vaccinated. Poultry keepers are strongly advised to apply to the nearest Veterinary Centre and have all their fowls vaccinated when they reach this age. They should not wait until the birds are infected. The vaccine will not cure the disease once it has broken out but it is a reliable preventive. Vaccination is given by the Veterinary Department free of charge. It is prepared at the Veterinary Research Institute, Ipoh.

Fowl Pox (Avian Diphtheria)

This disease is fairly common in Malaya. Although it can attack birds of any age it occurs most often in young growing birds. Even if it does not kill them it seriously interferes with their growth.

The disease occurs in three forms:

(a) the skin form: this is the most common. The comb, wattles, face, mouth and eyes, and some times the legs and feet, are covered with wart-like yellowish scabs which later become almost black.

(b) "eye and nose" form: the affected bird is depressed and shows a watery discharge from the eyes and nostrils which later thickens into yellowish cheesy pus, often filling the eyes which bulge out under its pressure.

(c) "mouth or diphtheritic" form: this is the most serious form. Yellow cheesy-like membranes develop on the tongue, the inside of the mouth, throat and the opening of the windpipe.

All three forms may occur in an outbreak and even in the same bird. Because their breathing and feeding are seriously interfered with many birds die of suffocation or starvation.

Treatment

Treatment is not recommended; it is best to kill infected birds and vaccinate any healthy birds that remain.

Prevention

Prevention is better than treatment. Birds can be immunised with a vaccine prepared at the Veterinary Research Institute. Vaccination can be carried out at any age over 2 weeks.

Infectious Coryza (Common Cold, "Roup")

This disease is common in Malaya. It usually attacks chicks about 3 weeks to 3 months old. The disease spreads rapidly and the death rate is often high, especially in untreated birds. Ask your Veterinary Officer to treat the sick birds.

The birds become dull, often sneeze and develop a discharge from the nostrils, at first thin and watery, later becoming sticky causing difficulty in breathing. There is frequently a swelling of the head, with formation of pus in the air sacs. Frequently one or both eyes become completely closed, with cheesy-like material in them. At this stage it closely resembles the "eyes and nose" form of powl pox. The appetite is completely lost.

Treatment

Untreated chicks usually die but if the sick birds are isolated, the discharges from the eyes and nostrils wiped away with mild antiseptics and all the birds given the drug *sulphadimidine* (also known by names such as "sulphameazathine" and "sulphamethazine") or *sulphathiazole sodium* in their drinking water many may be saved and the spread of the disease restricted. Individual birds may be dosed with *sulphathiazole*. Recovered birds are not, however, immune to a second attack.

Prevention

After an outbreak of the disease brooders and coops should be carefully cleaned with disinfectant.

Fowl Cholera

This disease does not occur very frequently in Malaya but outbreaks are encountered occasionally. When the disease does gain entry to a flock the death rate is very high and the losses are so great and sudden that this is one of the most dreaded diseases.

At the beginning of the outbreak sudden deaths are usually frequent and no sick birds may be seen; birds which looked healthy the previous night may be found dead in the morning. Later in the outbreak sick birds may be numerous. Some of these sick birds die within three or four days but others linger on for some time and a few may recover.

Treatment

The disease can only be definitely diagnosed by an expert and you should consult your nearest Veterinary Officer for advice on treatment and control. Treatment with *sulphadimidine* is successful.

Prevention

A vaccine is available. It is used for healthy birds only.

Coccidiosis

This disease is most often observed in young growing chicks, in which it can cause a high death rate, but it occasionally occurs in older birds as well.

The chicks are very depressed and pass blood-stained diarrhoea. They huddle together with the feathers fluffed out and have a plaintive cheep.

Treatment

The disease can be treated most readily in this country by the administration of drugs in the drinking water. The *sulphadimidine* drug, such as "sulphamethazine", "sulphamezathine" and "sulmet" have been used with success. There are also drugs such as *sulphaquinoxaline* and also *nitrofurazone* which can be given in the mash.

Your Veterinary Officer will advise on treatment with these drugs, which must be used with care.

Prevention

The disease is caused and spread by an organism which is passed in the bird's droppings. It is therefore important to destroy the droppings from sick birds so that they cannot infect healthy birds or re-infect sick birds under treatment. There is less risk of this happening if the young chicks are kept on wire-netting floors.

Disinfection can be carried out with washing soda solution followed by washing with 10% solution of ammonia. *Ammonia* is the best agent for disinfecting in this disease.

Infectious Laryngo-tracheitis

In many respects this disease resembles infectious coryza and Ranikhet disease and can only be differentiated with certainty by laboratory methods. The chickens may have diarrhoea, gasp for breath, cough up blood and have a discharge from the eyes and nostrils.

Control.

This disease is found in Malaya but it does not appear to be very prevalent as yet. However it is so widespread in many other countries that stringent regulations are imposed on the importation of chicks and eggs from these countries in order to minimise the chances of introducing a more virulent form of the disease.

Bacillary White Diarrhoea ("Pullorum Disease": "B.W.D.")

This disease of chicks is present in Malaya; stringent regulations are imposed in order to prevent new introductions through breeding stock and hatching eggs from abroad.

It is a disease of young chicks which usually develops within a few days after hatching; the chicks generally die within one week and the death rate is high even up to 3 weeks of age. Older birds are sometimes affected and chickens hatched from eggs from infected birds will often be infected. Many such eggs will not hatch because the young chicks die in the shell.

Control

If a number of chicks show this white diarrhoea call a Veterinary Officer. He will arrange for some of the birds to be examined at the Veterinary Research Institute and he may also do some preliminary tests himself. If the presence of the disease is confirmed it is usually best to destroy the whole hatch, disinfect the premises and start with fresh stock; cull infected adult birds.

Worms

Worms affect birds of all ages and are sometimes responsible for reduction in egg laying and poor condition of the birds; worm infested birds are also more liable to infection with other diseases.

The presence of worms can be diagnosed by the examination of droppings under the microscope; once the type of worm has been established suitable treatment can be given. It is best to seek veterinary advice before attempting treatment.

It must be borne in mind that good management is the best way of preventing worm diseases. Treatment should only be given when considered necessary by an expert.

GAPE WORMS

These worms can cause serious losses in young birds. The affected birds gasp and cough and the worms can be seen as small reddish-grey threads inside the wind pipe.

Treatment

Treatment is not easy. The chicks can be shaken gently in a box with "Barintar" dust so that they inhale the dust. This dust expels the worms.

A mixture of Tincture of Iodine 1 part, Turpentine 1 part and Coconut oil 3 parts can be applied with a feather down the wind pipe.

ROUND WORMS

These worms are found in the bowel and if present in large numbers may do much harm.

Treatment

Most drugs must be used with care but a safe remedy is *phenothiazine*. The dose for individual birds is 0.5 gram but it is often easier to treat groups of birds by mixing the powder in the mash. Mix 0.2 gram of the powder for each bird in the mash and repeat on the following two days.

There are also proprietary medicines on the market which are equally effective when used carefully. Those containing *piperazine* are safe and very effective.

Prevention

Control can be effected by keeping chicks on fresh ground which has not been used by the rest of the flock and by treating the infected ground after each breeding season with a heavy dressing of ground quicklime. After some weeks the ground should be turned over to bury the lime.

If clean ground cannot be obtained the run should be covered with a layer of clean earth to a depth of 4 inches, or the surface soil removed to a depth of 4 inches. The eggs live for a long time in the soil but most of them die off in a patch of ground kept free from poultry for one year.

TAPEWORMS

These are flat ribbon-like worms found in the bowel. A few tapeworms will do little harm but large numbers cause diarrhoea and even death.

Treament

Treatment is not always effective because the heads of the tapeworms are difficult to remove. Proprietary preparations are available on the market but a readily available drug is betel (areca) nut. The does is 2 grains of the finely ground nut per pound body weight given in a capsule, or one quarter of a medium sized nut can be given to each adult bird.

Prevention

Control of this parasite can be aided by using the methods recommended for Round Worms but as ants, snails and beetles may be carriers of the worm even more care must be taken to see that all droppings are removed from the run when this worm is found to be present in the flock.

EYE WORMS

These worms occur under the eyelids of fowls and sometimes cause inflammation of the eye which may even lead to blindness.

Treament

The only treatment is to remove the worms from the eye with a small pair of tweezers, or by flushing out the eye with tap water or a weak salt solution (1 teaspoonful in a pint of water).

Lice, Ticks and Fleas

These parasites are found affecting birds which are kept in dirty poultry houses. By irritating the birds' skin they disturb the birds' sleep and cause loss of condition and a drop in egg yield.

Treatment.

The birds should be given dust baths, or be dusted with derris, sulphur, or a reputable insect powder.

Prevention

These parasites can be prevented by regular cleaning and disinfection of brooders, coops, and hen-houses. The houses can be washed down with *gammexane* emulsions or suspensions.

Scaley Leg

This condition, which is caused by a very small parasite called the "scaly leg mite", is quite common. The mite burrows into the skin of the shanks. The irritation set up by the mites causes the formation of thick scales so that the shanks then appear "knotty".

Treament

Dipping the legs in kerosene is a simple method. Repeat in 30 days. A mixture of 1 part of sulphur to 4 parts of coconut oil, well rubbed in, often effects a cure in older cases; a mixture of 1 part of kerosene to 3 parts of margosa oil has also been used successfully.

Prevention

Control methods are similar to those for lice and ticks above. Affected birds should be isolated for treatment, or culled.

Favus

This skin disease is caused by a fungus. Affected birds show characteristic yellowish-white scaly spots, and crusts on the comb and other unfeathered parts of the head. It may spread to feathered parts if not treated.

Treatment

The following simple remedies have been found useful when well rubber into the lesions:—

(1) Vaseline containing 5% by weight of formalin. This is prepared by melting the vaseline, adding the formalin and then allowing the vaseline to harden again;

(2) Mixture of 1 part of sulphur to 4 parts of oil; or

(3) A sulphur ointment 1 part to 6.

Better results are achieved if the crusts are first removed with soap and water.

Prevention

Control of the spread of the disease is aided by isolating affected birds and by cleaning and disinfecting the house thoroughly. The disease is transmissible to man so care must be taken when handling the birds.

"Bumble Foot"

This is an abscess of the foot, commonly starting from an infected bruise or wound on the foot pad. The bird becomes lame and the foot is swollen.

Treatment

Veterinary aid should be sought, as in most cases the abscess will have to be incised. In cases where the abscess has burst the pus can be pressed out and the wound dressed with a mild antiseptic and then bandaged.

Emphysema

This condition is characterised by the presence under the skin of air which has escaped from the respiratory tract. This may be caused by wounds and other injuries. The affected birds look "puffed up".

Treament

A cure can be effected by carefully making a few cross cuts in the skin and then squeezing the air out. Veterinary aid should be sought.

Vitamin Deficiency

If it is suspected that the diet is dificient in vitamins it is advisable to consult your Veterinary Officer.

VITAMIN A DEFICIENCY

In chickens this condition may appear about the age of 4 weeks. The chicks lose weight, have a staggering gait and later tend to crouch on their hocks. Soreness round the eyes is common and there may be cheesy material under the eyelids. The condition also occurs in adult birds.

Treatment

Affected birds can be treated by dosing them twice daily with a few drops of cod liver oil by mouth, using a dropper. In less advanced cases the cod liver oil or other reliable products containing the vitamin should be added to the mash.

Prevention

The condition may be prevented by providing plenty of fresh green food such as chopped lettuce, spinach, cabbage or grass. 1% cod liver oil or red palm oil should be added to the mash if the birds are confined.

13. LOSSES DUE TO POISON

It is possible that some deaths may be due to poisoning. If this is suspected expert advice should be sought in order that suitable material can be sent for analysis.

It is important to remember that chickens can be poisoned by eating decomposed carcases of birds, cats, dogs, etc. All carcases should be buried.

14. VICES

Feather-picking and Cannibalism

There are various causes for these habits, as for example deficiency of protein or hard grain in the diet; irritation from parasites and close confinement may start the habit.

Control is not easy once the habit has started. The diet may be changed, all injuries treated promptly, the birds treated for fleas and mites. If these methods fail the point of the beak may be blunted by removing 3/16 of an inch.

Another treatment recommended is the addition of 2% of salt to the mash for three days but this must be done with care as excess salt is poisonous.

Egg Eating

This habit can sometimes be stopped by feeding a balanced diet including more greens, or by blunting the beak.

15. CONCLUSION

The important points to which attention has been drawn may be summarised as follows:—

(1) **Careful selection of the system of poultry keeping and of the birds.**

(2) **Careful attention to rearing, feeding, housing and general management.**

(3) **Prompt action against diseases including vaccination of chickens before the outbreak of certain diseases, isolation of sick birds and proper disposal of dead chickens.**

(4) **The need for sound knowledge in the economic field e.g. in purchasing suitable foodstuffs and other materials wisely and in selling products to the best advantage in the market.**

16. PUBLICATIONS SUGGESTED FOR FURTHER STUDY

(1) TWEED'S POULTRY KEEPING IN INDIA, by A. E. Slater. Thacker, Spink & Co. (1953) Ltd., Calcutta.

(2) FODDERS AND FEEDINGSTUFFS IN MALAYA, by Gunn Lay Teck. Department of Agriculture, Kuala Lumpur.

(3) POULTRY BREEDING, Bulletin No. 146 of the Ministry of Agriculture and Fisheries, U.K.

(4) SCIENTIFIC PRINCIPLES OF POULTRY FEEDING. Bulletin No. 7 of the Ministry of Agriculture and Fisheries, U.K.

(The United Kingdom publications (3) and (4) can be obtained through the Government Publications Sales Bureau, Fullerton Building, Singapore.)

APPENDIX 1

THE DEEP LITTER SYSTEM FOR POULTRY

The Deep Litter System, also known as Built-Up Litter System, is an intensive method of poultry farming. Under this system birds are kept in the poultry house all the time, and have no access to the outside. As against other systems of poultry keeping one acre of land can accommodate about 2,000 fowls. The system is labour saving and with proper siting of houses and management only one attendant is required to look after 2,000 fowls. The system can be applied with equally good results in the backyard as in commercial farms.

Contrary to normal expectation, there is no offensive smell. The litter in due time gets broken down and becomes excellent humus and fertiliser. If the system is properly applied the litter soon becomes charged with bacteria and other micro-organisms. These break down the manure and litter particles into a friable mass and the decomposed manure becomes part of the litter. The organisms not only break down the manure but use the moisture in the droppings while the heat generated in the litter results in further evaporation of moisture.

For the present these notes are confined to the housing of "layers" though the Deep Litter System can successfully be applied to the rearing of growers and table poultry.

HOUSING

Perhaps the biggest item in this system is the cost of construction of the house. A proper poultry house is essential; 4 to 5 sq. ft. of space depending on the breed and size of flock is allowed for each adult bird. Thus a house 20 feet x 20 feet will take about 100 birds and a 7 feet x 7 feet house is sufficient for 12 layers though in the case of smaller flocks, it is advisable to increase the floor space to 6 or 7 sq. ft. a bird. The height of the house should be at least 6 feet at the eaves to allow headroom for the attendant. The walls should be boarded to a height of 3 feet all round and the upper portion enclosed with 1 to 2 inch wire netting. A door 3 feet by 6 feet should be provided. Houses can be built in rows for larger flocks. The floor may be of earth, concrete or wood. In damp sites it is advisable to raise the floor about one foot from the surrounding areas.

LITTER

This may be wood-chippings, sawdust, shavings, padi husks or dried grass. Whatever is used it should be dry. The depth of the litter should be 6 to 10 inches depending on the material used.

EQUIPMENT

Perches. Ample perching space should be provided. 2 inch x 2 inch timber or 2½ inch diameter jungle rollers are satisfactory. Perches should be about 1½ to 2 feet high, 16 inches apart and 2 feet from the back wall. A perching space of about 8 inches a bird is adequate.

Nests. Individual nests or a community nest may be employed. If it is desired to keep records of layers, trap nests should be provided. Nests should be so placed as to make egg collection simple. 1 nest is sufficient for 5 layers. The size of individual nests is 12 inches by 13 inches by 13 inches with a 4 inch lip in front. Nests may be placed 1½ ft. to 2 ft. off the ground. Nesting material may be of sawdust, chippings, padi husks, etc.

Water Trough. This should be placed outside the building to prevent water spilling on the litter. The water supply can be regulated by using a ball valve attached to the main. A trough 3 feet long by 5 inches wide and 4 inches deep is adequate for 100 fowls. The water trough may be placed at a height of 10 inches from the floor. If it is desired to place the trough higher, stepping boards should be provided.

Automatic Dry Mash Hopper. This may take various shapes and sizes. 4 feet of feeding space is necessary for 100 birds.

Trough for scraps, grass or wet mash. Where it is desired to feed wet mash or scraps or grass in addition to the dry mash, it would be of benefit to provide an additional long trough attached to the wall.

MANAGEMENT OF LITTER

Though a well constructed house is important, the proper management of the litter is essential. The litter may be built up gradually by adding a couple of inches once a month until the desired depth is obtained or the required depth of litter could be put in at one time. It need not be changed regularly. Once a year would be sufficient. Under no circumstances should the litter be allowed to get wet and if it tends to cake, it should be forked, turned over and redistributed. It is not necessary to use lime to assist in keeping the litter dry. If through some unfortunate circumstance the litter should get wet, it is best to replace it with dry litter. When changing the litter it is advisable to leave an inch or two of old litter in the house. This will serve as a "starter" and assist bacterial fermentation and more rapid break down of the litter.

FEEDING

Unlike birds on range the Deep Litter System does not permit of birds picking up food to supplement their ration. It is, therefore, important that a well balanced food complete with grit and shell be provided. Greens in the form of grass or vegetable once daily will keep the birds busy and active and help in preventing vice. Dry mash feeding is labour saving. Sufficient mash can be held in the hopper to last a week or more. Some poultry rearers may have household scraps which may be incorporated with bran and other ingredients and fed as wet mash. About 2 ounces of grain for each bird should be fed in the evening.

VICES

Birds kept intensively are more susceptible to vices like cannibalism and feather picking. Offending birds should be removed and if the vice is general a thorough investigation should be made immediately.

CULLING

Vigorous culling of poor layers should be practised in order to keep down the cost of feeding.

VALUE OF LITTER

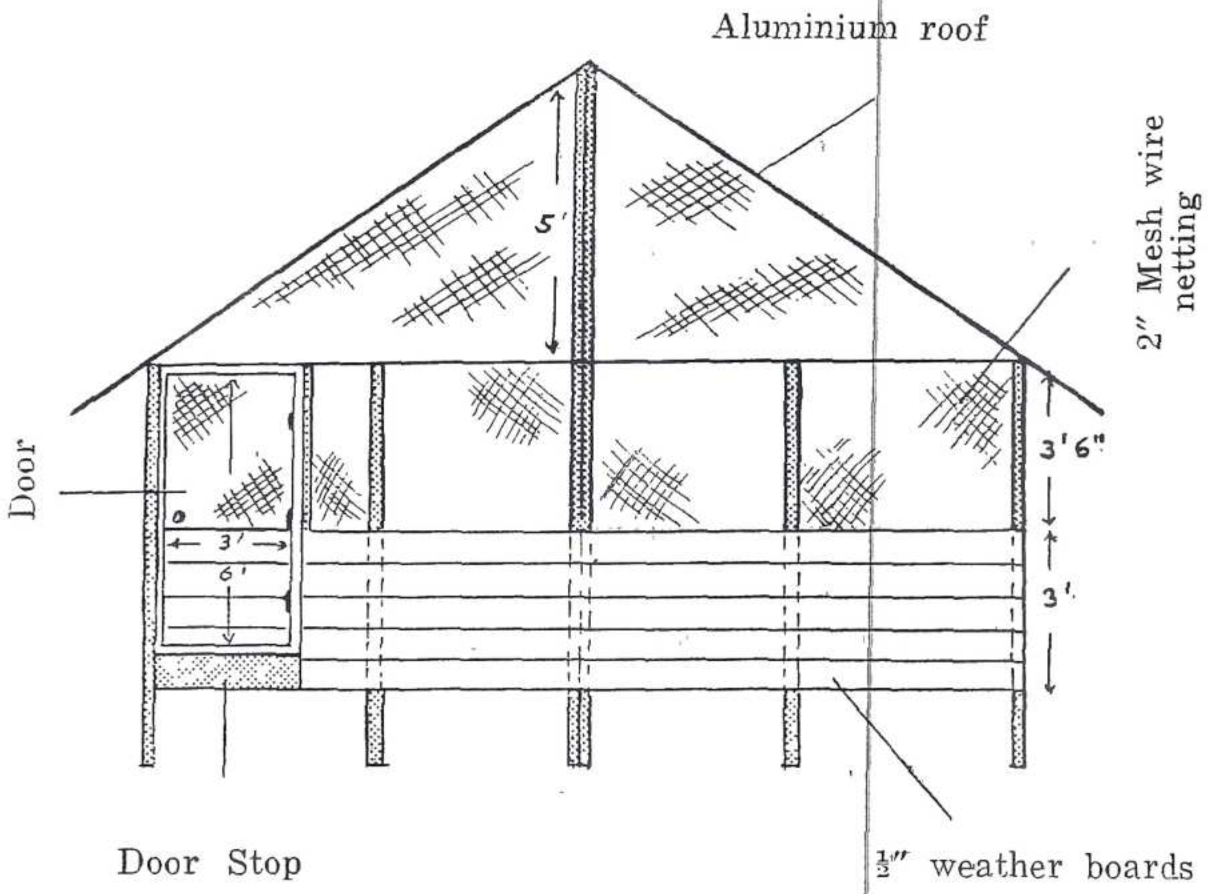
Poultry manure by itself is a valuable fertiliser being rich in nitrogen. The total weight of manure excreted by a flock of 100 birds is 10 tons per annum. This would contain nitrogen equivalent to 1 ton of ammonium sulphate, phosphates contained in just over 7 cwt. of superphosphate and potash equal to that in nearly 2½ cwt. of nitrate of potash. In the past poultry manure has not been popular as a fertiliser mainly because of difficulties in collection, drying and storage. In the form of deep litter these difficulties are overcome. Properly broken-down litter is a valuable fertiliser. Its manurial value increases up to 2 years of age. Its small particles and fairly dry state enable it to be evenly distributed over land or gardens either by hand or mechanical means. 2 year old litter contains about 2.4% nitrogen, 3.4% phosphorus and 1.9% potash. In a house containing 300 birds where 1¾ tons of wood shavings had initially formed the litter material, 9½ tons of deep litter was eventually removed as fertiliser.

ESTIMATED COST OF DEEP LITTER HOUSE

A house 20 feet by 20 feet with 4 inch diameter jungle roller for posts, ½ inch weather boards for the bottom section of the wall, 2 inch wire netting for the upper section and aluminium roof will cost approximately $250. The same house with attap roof will cost about $190. The price includes the perches but water trough, food hopper, nests and a long trough will cost about $2.50, $10.00, $20.00 and $9.00 respectively. A 10 feet by 10 feet house with aluminium roof costs about $100 and a 7 feet by 7 feet house for 10 birds costs about $60.

There is scope for the wider utilisation of the Deep Litter System in this country. The system would be the solution for those who have little land at their disposal but would like to keep a few fowls for fresh eggs.

DEEP LITTER HOUSE



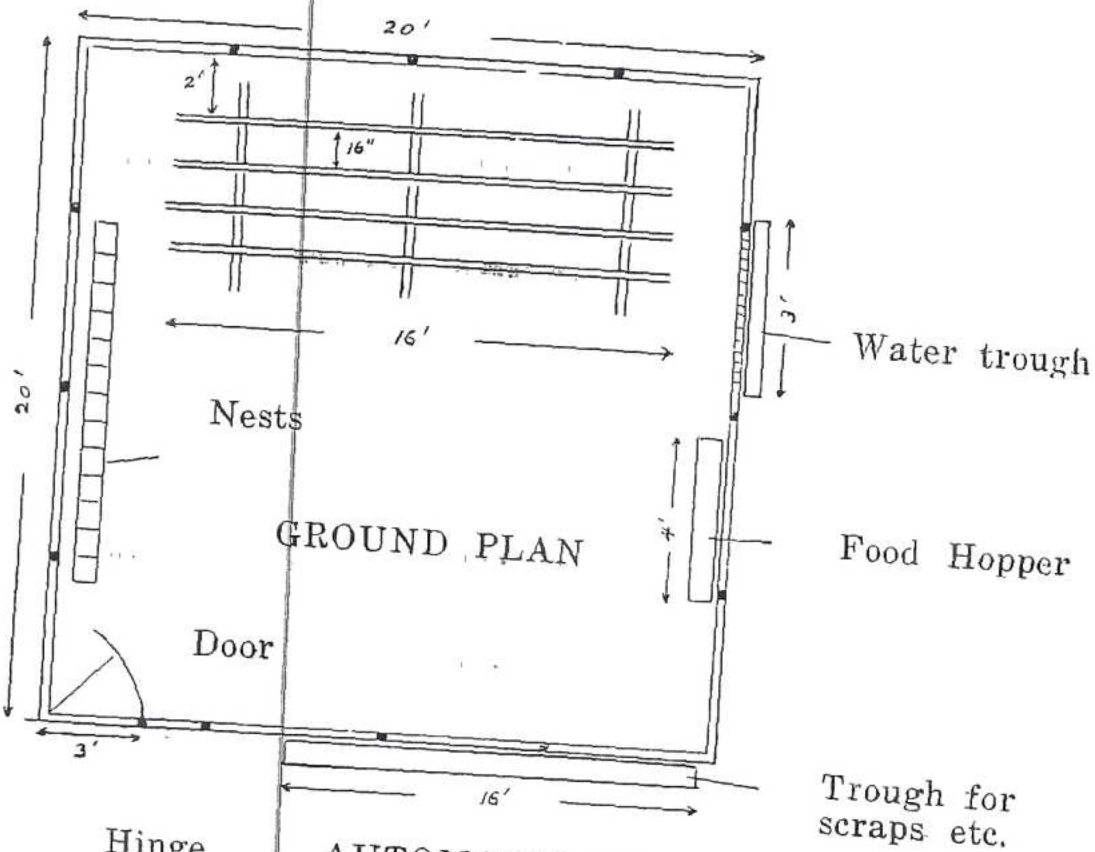
FRONT VIEW

4" diameter Jungle Rollers for Posts
½" Weather Boards all round
2" Mesh Wire Netting
2" x 2" or 2½" diameter Jungle Rollers for perches.

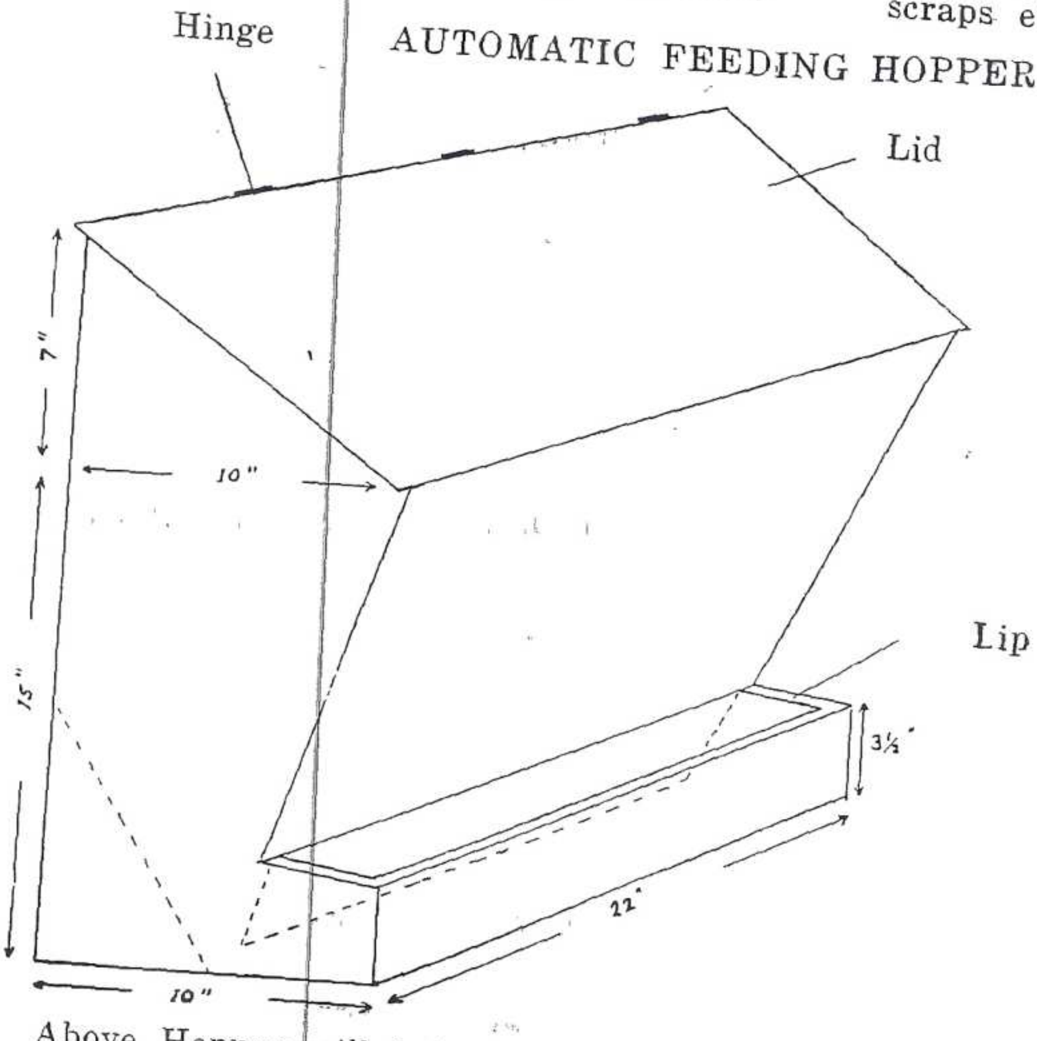
ESTIMATED COST

(aluminium roof) $250.00

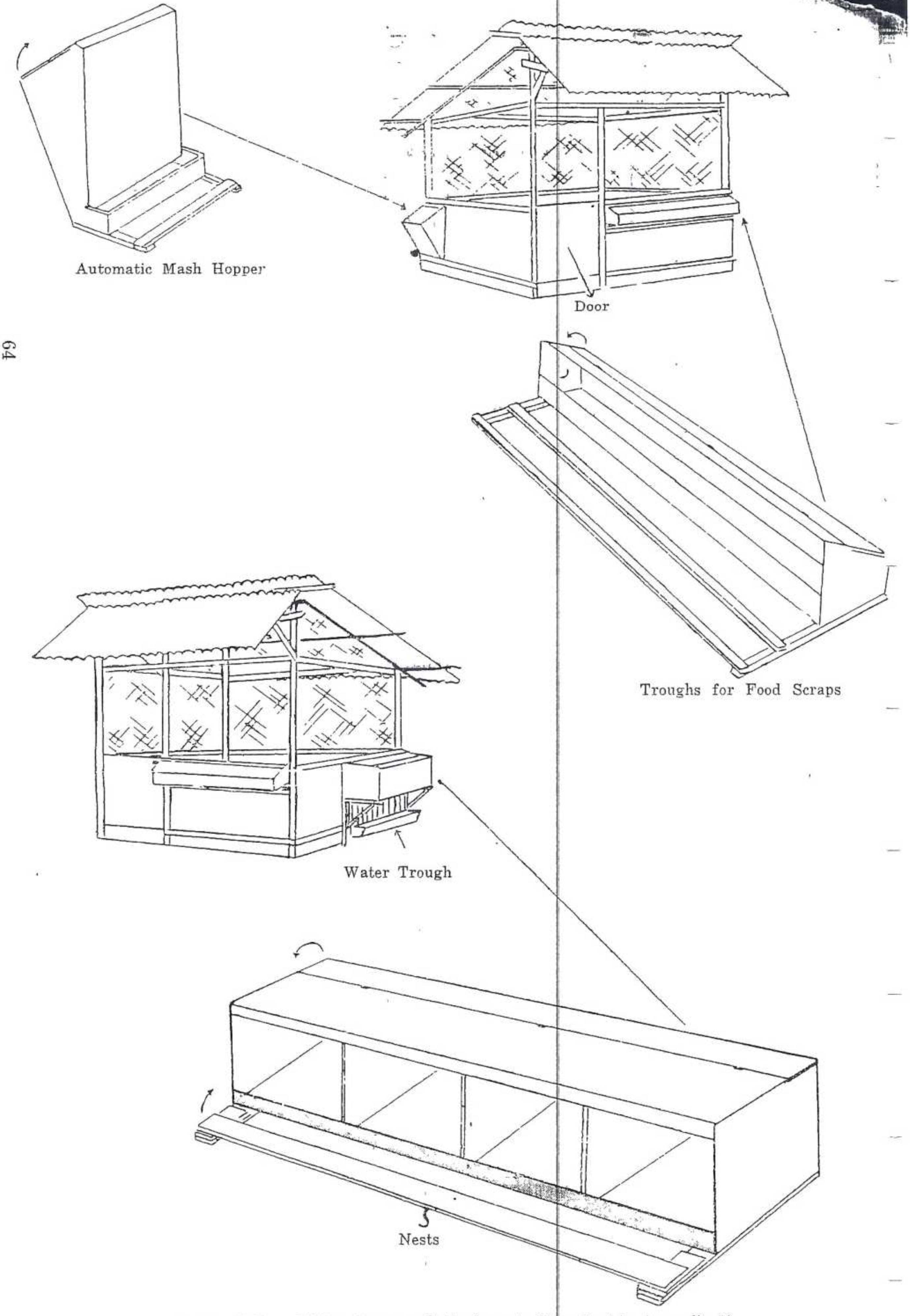
(attap roof) $190.00



AUTOMATIC FEEDING HOPPER



Above Hopper will hold one week's dry mash for 10 birds.



A Small Deep Litter House and Equipment (Described in Appendix 1)

APPENDIX 2

ALTERNATIVE RATIONS

Alternative rations used in some parts of the country:—

Growers Mash

Tapioca refuse	25	parts by weight
Fish	5	,, ,, ,,
Groundnut cake	10	,, ,, ,,
Rice bran	40	,, ,, ,,
Copra cake	20	,, ,, ,,

Layers Mash

(1)	Fish	15	parts by weight
	Groundnut cake	15	,, ,, ,,
	Tapioca refuse	25	,, ,, ,,
	Coconut cake	20	,, ,, ,,
	Maize	10	,, ,, ,,
	Rice bran	15	,, ,, ,,
(2)	Ground maize	25	,, ,, ,,
	Broken rice	10	,, ,, ,,
	Rice bran	25	,, ,, ,,
	Coconut waste	28	,, ,, ,,
	Fish meal (salt free)	10	,, ,, ,,
	Salt	0.5	,, ,, ,,
(3)	Rice bran	35	,, ,, ,,
	Yellow maize meal	20	,, ,, ,,
	Oats	15	,, ,, ,,
	Fishmeal	15	,, ,, ,,
	Groundnut cake	15	,, ,, ,,
	Red palm oil	2	,, ,, ,,

WHERE TO BUY THIS BOOK.

The book may be obtained

(1) from the Director of Veterinary Services, Batu Road, Kuala Lumpur for Orders by Post.

(2) from the following offices of the Department of Agriculture and the Department of Veterinary Services:

Agricultural Department		**Veterinary Department**	
Director of Agriculture, Kuala Lumpur.		Director of Veterinary Services, Batu Road, K.L.	
State Agricultural Officer:		State Veterinary Officer:	
JOHORE	- Johore Bharu	JOHORE	- Johore Bharu
KEDAH	- Alor Star	KEDAH	- Alor Star
PERLIS	- Kangar	PERLIS	- Kangar
KELANTAN	- Kota Bharu	KELANTAN	- Kota Bharu
NEGRI SEMBILAN	Seremban	NEGRI SEMBILAN	Seremban
PAHANG	- Kuantan	PAHANG	- Raub
PERAK	- Ipoh	PERAK	- Ipoh
SELANGOR	- Kuala Lumpur	SELANGOR	- Kuala Lumpur
TRENGGANU	- Kuala Trengganu	TRENGGANU	- Kuala Trengganu
MALACCA	- Malacca	MALACCA	- Malacca
PENANG	- Butterworth	PENANG	- Penang

N.B.—The cost of the book **$0.50** (or 1/6d.) must accompany orders.

Printed by
THE ECONOMY PRINTERS LTD.
Kuala Lumpur.
147—1957

First Printing (1957)—5000
Second Printing (1957)—5000